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AN ACTUATOR ASSEMBLY

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The present invention relates to actuator assemblies and in particular electrical actuators used to actuate components, for example door locks, door latches or door deadlocks in vehicles.

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It is an object of the present invention to provide a compact actuator assembly. It is a further object to provide an actuator assembly that is easy to install. It is a further object to provide an actuator assembly that has relatively few components and is relatively cheap to produce.

Thus according to the present invention there is provided an actuator assembly including a motor having a body portion and a drive shaft, the drive shaft being drivably connected to a pinion, the pinion drivingly engaging an array of gear teeth of a gear rack the array of gear teeth having a first side adjacent the motor, in which the gear rack is pivotally mounted via a pivot about a pivot axis on said first side of the array of gear teeth.

Preferably the pivot axis passes through the body and/or is proximate that end of the motor remote from the pinion.

Preferably the gear rack includes at least one stop to limit movement of the rack relative to the body portion and preferably the drive shaft passes between the array of gear teeth and a guide portion proximate the gear teeth.

Preferably each stop supports the guide portion.

According to a further aspect of the invention there is provided an actuator assembly including a motor having a body portion and a drive shaft, the drive shaft being drivably connected to a pinion, the pinion drivingly engaging an array of gear teeth of a gear rack with the gear rack being mounted for movement on the body portion.

Preferably the motor is an electric motor.

The invention will now be described by way of example only with reference to the drawings in which;-

Figures 1, 2 and 3 are different isometric views of an actuator assembly according to the present invention.

With reference to figures 1-3 there is shown an actuator assembly 10 which includes a motor 12 (in this case an electric motor). The motor includes a body portion 14 and a drive shaft 16. The drive shaft is drivably connected to a pinion 18. The pinion 18 drivingly engages an array of gear teeth 20 fixed to a gear rack 22.

The gear rack is of generally  <sup>$\frac{1}{8}$  of circle</sup> octant shape with the array of gear teeth 20 being arranged in an arcuate manner. The array of gear teeth have a first side 21 adjacent the motor. The gear rack includes a boss 24 which fits into a hole (not shown) of a housing (not shown) to provide a pivot. Gear rack 22 thus can rotate about axis 25A of boss 24. It should be noted that axis 25A passes through body portion 14.

*pub 1331* The housing substantially surrounds the motor and gear rack and can be substantially sealed against the ingress of contaminants eg. dirt, dust, or water. The motor is secured in the housing, preferably by engagement of each end of the drive shaft with the housing.

*pub 1331* Preferably the housing is of at least two part form, a first part having two cut-outs each cut-out accepting and supporting one end of the drive shaft, the second part having complementary cut-outs which in conjunction with the cut-outs of the first part provide a journal bearing for each end of the drive shaft 16. The second part also has a hole to accept and provide a journal for boss 24.

*pub 1331* In use the boss is connected to a lever situated on the outside of the housing, the lever being connected to the component to be actuated.

Extending beyond the gear teeth 20 there are two stops 26 and 28 which limit movement of the gear rack relative to the body portion 14 by engagement with the drive shaft 16. Figure 1 shows the gear rack 22 at an extreme position wherein stop 28 has engaged drive shaft 16. Figure 1 also shows (in chain dotted line) the other extreme of movement of the gear rack relative to the body portion wherein stop 26 has engaged drive shaft 16.

Guide portion 30 connects stops 26 and 28, resulting in a stronger arrangement. Guide portion 30 is mounted on the opposite side of shaft 16 to the array of gear teeth 20. Guide portion 30 includes a guide surface 32 along which the drive shaft 16 passes in close proximity or alternatively in light engagement therewith. When the motor 12 is producing torque the engagement of the pinion with appropriate gear teeth of the array causes a separating force which preferably can be counteracted by the guide surface 32

acting upon the drive shaft 16, thus reducing the load as seen by the pivot 25.

In use operation of the motor in a first rotational direction causes the pinion to move the gear rack to a first position and operation of the motor in a second rotational direction causes the pinion to move the gear rack to a second position.

In further embodiments the gear rack can be of an alternative segment shape such as a quadrant or a sextant and in yet further embodiments the gear rack need not be of a segment shape.

The invention provides for a particularly compact arrangement since a substantial part of the gear rack can be arranged to lie alongside the motor. Furthermore the actuator assembly is axially compact, it being noted that no part of the gear rack projects beyond that end of the drive shaft having the pinion secured thereto. It should also be noted that the actuator shown in the figures only has two moving parts namely the drive shaft/pinion and the gear rack.

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